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## Final Report

### OBSERVATIONS OF COMETS WITH THE IUE

NASA Grant NSG-5393

Period Covered: July 1, 1979 - September 30, 1992

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## Final Report

### OBSERVATIONS OF COMETS WITH THE IUE

NASA Grant NSG-5393

Covering the Period from July 1, 1979 - September 30, 1992

This is the final report for NASA grant NSG-5393, *Observations of Comets with the IUE*, which began in July 1979 and continued until September 30, 1992. Our work during this period has been described by semi-annual and annual status reports, the last one having covered the period March 1, 1991 - February 29, 1992. We here detail the work done during the period March 1, 1992 - September 30, 1992 plus additional work done in November 1992 under a no-cost extension.

We attach in Appendix A a complete list of publications related to *IUE* observations of comets from 1980 to the present. Publication numbers 46-51 appeared during the March 1, 1992 - September 30, 1992 period and copies of these are being forwarded to the NSSDC along with this report.

Comet Shoemaker-Levy (1991a<sub>1</sub>) was observed on several dates in June and July 1992. This was a *new* comet with a high ratio of gas of dust, and the July observations were made in coordination with two *Hubble Space Telescope* cycle 1 GO programs. Comparison of the relative brightness of a given emission between *IUE* (10" x 20") and the *HST* Faint Object Spectrograph (1".4 x 4".3) apertures provides information about the spatial distribution of the emitting species from which the excitation mechanisms can be inferred. In the case of relatively gassy comets, such as this one, the detection of CO<sub>2</sub>, via CO Cameron band emissions, by the FOS can be related to the observed CO<sub>2</sub><sup>+</sup> emission (seen by both the FOS and the *IUE* spectrographs) and subsequently placed in the context of relative CO<sub>2</sub> abundance by comparison with *IUE* spectra of over 40 comets going back to 1978. The comparison between the *HST* and *IUE* spectra was abetted by the fact that comet Shoemaker-Levy did not show any indication of short-term temporal variability.

Comet Swift-Tuttle (1992t) is a moderately bright periodic comet that, like P/Halley, shows relatively strong temporal variations on a scale of hours and days. It was recovered 130 years after its first known apparition and aroused great interest because its orbit comes close to intersecting that of the Earth. *IUE* observations of this comet were made in November 1992 and the detected variability was reported on IAU circular 5663. Coordinated ground-based observations (by G. P. Tozzi, Osservatorio Astrofisico di Arcetri) led to the first detection of the CIIλ9850 transition that complements CIIλ1931 observed by the *IUE* short wavelength spectrograph and provides a means of indirectly determining the CO abundance.

Further observations of Ceres were carried out in collaboration with M. F. A'Hearn (University of Maryland) to extend and confirm the results obtained earlier and recently published (paper number 47 in Appendix A). Analysis of data obtained in 1990 on comets Austin (1990 V) and Levy (1990 XX) was completed, in collaboration with S. A. Budzien, and presented at the October 1992 meeting of the AAS Division for Planetary Sciences.